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EXAMINER	
HUANG, DAVID S	
ART UNIT	PAPER NUMBER
2611	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/560,927	GRANT, ALEXANDER	
	Examiner	Art Unit	
	DAVID HUANG	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Objections

2. Claims 1-9 and 17-25 are objected to because of the following informalities:

Claim 1, line 4, "the timing" should be --a timing--.

Claim 2, line 2, "the probability" should be --a probability--.

Claims 3-9 are dependent on claims 1 and 2, and are similarly objected.

Claim 17, line 4, "the timing" should be --a timing--.

Claim 18, line 2, "the probability" should be --a probability--.

Claims 19-25 are dependent on claims 17 and 18 and are similarly objected.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. **Claims 5-9 and 17-30** rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 recites the limitation "an estimate of the second transmission" in step f. It is unclear if this is a new limitation or if it refers to the estimate of the second transmission in step

b of claim 1. For examination on the merits, the limitation recited in step f of claim 5 will be understood to be an "updated" estimate of the second transmission.

Claims 6-9 are dependent on claim 5, and are similarly rejected.

Claim 17 recites an "apparatus for estimating…the apparatus being arranged to…" perform a series of method steps that correspond to those found in claim 1. It is unclear whether the claim is directed towards an apparatus or a method, as the preamble indicates an apparatus claim, but the body of the claim indicates method steps without any corresponding elements recited to perform the steps. For examination on the merits, the claim will be interpreted in view of claim 1.

Claims 18-25 are dependent on claim 17, and are similarly rejected.

Claim 26 recites an "apparatus for estimating…the apparatus being arranged to…" perform a series of method steps that correspond to those found in claim 10. It is unclear whether the claim is directed towards an apparatus or a method, as the preamble indicates an apparatus claim, but the body of the claim indicates method steps without any corresponding elements recited to perform the steps. For examination on the merits, the claim will be interpreted in view of claim 10.

Claims 27-30 are dependent on claim 26, and are similarly rejected.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 15 and 16 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

In **claim 15 and 16**, a "computer program" is being recited; however, a computer program would reasonably be interpreted by one of ordinary skill in the art as software per se. This subject matter is not limited to that which falls within a statutory category of invention because it is limited to a process, machine, manufacture, or a composition of matter. Software is functional descriptive material and functional descriptive material is non-statutory subject matter.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 1-3, 5-12, 14-19, 21-28, and 30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wei et al. (US 7,321,581) in view of Fuller et al. (US 2003/0095590).

Regarding **claims 1 and 17**, Wei et al. discloses a method of estimating a timing of a first transmission received with a second transmission as a combined signal over a multiple access interference channel (MAI, col. 1, line 21), comprising:

a. estimating the timing of the second transmission (User 2 Signal, RAKE receiver outputs channel estimation (timing), Fig. 4);

b. demodulating, decoding and remodulating the second transmission, on the basis of the estimated timing of the second transmission, to generate an estimate of the second transmission (soft decision 8, signal regenerator 5 both receive channel estimation from RAKE 3, Fig. 4);

c. cancelling the estimate of the second transmission from the combined signal to generate an estimate of the first transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, line 13); and

d. estimating the timing of the first transmission from the estimate of the first transmission (RAKE of following PIC stage implements channel estimation, col. 13, lines 14-28, Fig. 4; See Fig. 1 for repeating PIC structure).

However, Wei et al. fails to expressly disclose demodulating the second transmission on the basis of the estimated timing of the second transmission.

Fuller et al. discloses a similar parallel interference cancellation apparatus and method that performs channel estimation prior to RAKE demodulation, and uses provides the channel estimation to the RAKE demodulator 68 and regeneration block 74 (Fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art to modify Wei et al. such that RAKE demodulation is performed based on the channel estimation, since such a modification is suggested by the similar interference cancellation taught by Fuller et al. (Fig. 2).

Regarding **claims 2 and 18**, Wei et al. discloses everything applied to claims 1 and 17, and further discloses the cancelling of the estimate of the second transmission is weighted according to a probability of the estimate (f is the reliability coefficient for decision result a; col. 10, line 59 - col. 11, line 33).

Regarding **claims 3 and 19**, Wei et al. discloses everything applied to claims 2 and 18, and further discloses the probability of the estimate is calculated using a soft decoding technique to decode the second transmission (soft decision maker 8, col. 10, lines 59-65, Fig. 4).

Regarding **claim 5 and 21**, Wei et al. discloses everything applied to claims 1 and 17, and further disclose:

e. demodulating, decoding and remodulating the first transmission (User 1 signal, Fig. 4), on the basis of the estimated timing of the first transmission, to generate an estimate of the first transmission (soft decision 8, signal regenerator 5 both receive channel estimation from RAKE 3, Fig. 4, in PIC structure of the next stage; col. 13, lines 14-20; see Fig. 1);

f. cancelling the estimate of the first transmission from the combined signal to generate an estimate of the second transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, PIC structure of next stages is processes in the same way, line 13; col. 13, lines 14-20); and

g. estimating the timing of the second transmission from the estimate of the second transmission (RAKE of following PIC stage implements channel estimation, col. 13, lines 14-28, Fig. 4; See Fig. 1 for repeating PIC structure).

Regarding **claims 6 and 22**, Wei et al. discloses everything applied to claims 5 and 21, and further discloses repeating steps b to g so as to obtain improved estimates of the timings of the first and second transmissions (Fig. 1, for repeating PIC structure; col. 3, line 62 - col. 4, line 3; removes MAI on expected users by other users).

Regarding **claims 7 and 23**, Wei et al. discloses everything applied to claims 5 and 21, and further discloses the combined signal includes one or more further transmissions (Fig. 4, Users 1, 2..N signals).

Regarding **claims 8 and 24**, Wei et al. discloses everything applied to claims 7 and 23, and further discloses

step a includes estimating the timing of the one or more further transmissions, step b includes demodulating, decoding and remodulating the one or more further transmissions, on the basis of the respective estimated timing of the one or more further transmissions, to generate an estimate of the one or more further transmissions, and step c includes cancelling the estimate of the one or more further transmissions from the combined signal to generate an estimate of the first transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, line 13; Fig. 1).

Regarding **claims 9 and 25**, Wei et al. discloses everything applied to claims 8 and 24, and further discloses step f includes cancelling the estimate of the one or more further transmissions from the combined signal to generate the estimate of the second transmission (MAI estimation and interference cancellation 6, Fig. 4; col. 12, line 50 - col. 13, line 13; Fig. 1).

Regarding **claims 10 and 26,** Wei et al. discloses a method of estimating the timings of a plurality of transmissions received as a combined signal over a multiple access channel, comprising:

a. estimating the timings of each of the plurality of transmissions (Users 1-N, RAKE receiver outputs channel estimation (timing) for each user, Fig. 4);

b. soft demodulating, soft decoding and soft remodulating current estimates of each of the plurality of transmissions, on the basis of their respective estimated timings, to generate soft estimates of each of the transmissions (soft decision 8, signal regenerator 5 both receive channel estimation from RAKE 3, Fig. 4);

c. updating the current estimates of each of the transmissions by cancelling the soft estimates of the other transmissions from the combined signal (MAI estimation and partial interference cancellation 6, Fig. 4, col. 12, line 51 - col. 13, line 13);

d. estimating the timings of each of the transmissions from the respective current estimates of the transmissions (PIC structure of next stage, Fig. 4, contains same RAKE with channel estimation, Fig. 4, col. 13, lines 14-21); and

e. repeating steps b to e to obtain progressive estimates of the timings of each of the transmissions (col. 13, lines 13-21, Fig. 4; Fig. 1).

However, Wei et al. fails to expressly disclose demodulating the second transmission on the basis of the estimated timing of the second transmission.

Fuller et al. discloses a similar parallel interference cancellation apparatus and method that performs channel estimation prior to RAKE demodulation, and uses provides the channel estimation to the RAKE demodulator 68 and regeneration block 74 (Fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art to modify Wei et al. such that RAKE demodulation is performed based on the channel estimation, since such a modification is suggested by the similar interference cancellation taught by Fuller et al. (Fig. 2).

Regarding **claims 11 and 27**, Wei et al. discloses everything applied to claims 10 and 26, and further discloses steps a to e are repeated until a predetermined condition is satisfied

(multiple PIC stages with a "last stage", col. 13, lines 14-25, Figs. 3 and 4; a "last stage" stage implicitly discloses a fixed number of iterations or stages in the PIC receiver, and would be a satisfied predetermined condition, once a signal reaches the end of the chain).

Regarding **claims 12 and 28**, Wei et al. discloses everything applied to claims 11 and 27, but fail to expressly disclose outputting the soft decoded current estimates.

Fuller et al. discloses the output of the symbol decision step is output (symbol decision block 70, Fig. 2) in addition to being fed back for weighting and regeneration.

Therefore, it would have been obvious to one of ordinary skill in the art to modify the Wei et al. to specify outputting the symbol decision output, since Fuller et al. discloses a similar interference cancellation circuit that performs symbol decision output and thus suggests such an implementation (Fig. 2).

Regarding **claims 14 and 30**, Wei et al. discloses everything applied to claims 10 and 26, but fails to expressly disclose the timing estimation steps are performed using coherent detection.

Fuller et al. discloses channel estimation is accomplished using a "fast" cyclic correlator using the extracted midamble (page 3, [0027], Fig. 2).

Because both Wei et al. and Fuller et al. disclose techniques for channel estimation, it would have been obvious to one of ordinary skill in the art to substitute one channel estimation teaching for the other for the predictable result of accomplishing channel estimation using a correlator and extracted midamble data.

Regarding **claims 15 and 16**, Wei et al. discloses everything applied to claim 10, but fails to expressly disclose a computer program product storing a computer program for performing the method of claim 10 when executed.

Fuller et al. discloses using hardware, software, or a combination thereof, to implement the structure and functionality of an interference cancellation technique (pages 2-3, [0025], [0050]).

Therefore, it would have been obvious to one of ordinary skill in the art to specify a computer program for performing the interference cancellation technique of Wei et al. and Fuller et al. since it allows flexibility in implementation using hardware, software, or a combination of the two, and a software implementation is suggested by Fuller et al.

8. **Claims 4 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wei et al. (US 7,321,581) in view of Fuller et al. (US 2003/0095590) as applied to claims 2 and 18 above, and further in view of Wang (US 2004/0174939).

Regarding **claim 4 and 20**, Wei et al. and Fuller et al. disclose everything applied to claims 2 and 18, but fail to expressly disclose the probability of the estimate is calculated using a soft demodulating technique to demodulate the second transmission.

Wang discloses a novel class of receivers in which soft demodulators and soft outer channel decoders exchange information to successively improve receiver performance. When the channel is unknown and estimated by using pilot symbols, the decoded code bits with high reliability can act as pilots for channel re-estimation. Iterative channel estimation and data detection further improves receiver performance (page 1, [0010]). At the output of the soft demodulator 210 are the a posteriori symbol probabilities (page 3, [0043], Fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to provide the Wei et al. and Fuller et al. with the soft demodulator that outputs symbol probabilities taught by Wang since it improves receiver performance.

9. **Claims 13 and 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wei et al. (US 7,321,581) in view of Fuller et al. (US 2003/0095590) as applied to claims 10 and 26 above, and further in view of McCarty (US 2203/0016622).

Regarding **claims 13 and 29**, Wei et al. and Fuller et al. disclose everything applied to claims 10 and 26, but fail to expressly disclose the timing estimation steps are performed using differential detection.

Nevertheless, Fuller et al. discloses a coherent detection in that channel estimation is accomplished using a "fast" cyclic correlator using the extracted midamble (page 3, [0027], Fig. 2).

McCarty discloses differential detection does not perform any channel estimation, and would thereby reduce complexity and eliminating the need for any pilot tones or other reference encoding techniques. Rather, differential detection compares each transmitted carrier state with another to establish a change in phase (timing information) between the two (page 1, [0009]).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the system of Wei et al. and Fuller et al. to obtain phase information (timing information) using differential detection instead of coherent detection techniques, since it reduces complexity and eliminates the need for pilot tones.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID HUANG whose telephone number is (571)270-1798. The examiner can normally be reached on Monday - Friday, 8:00 a.m. - 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on (571) 272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DSH/dsh
6/18/2009
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